

# Identifying Indicators of State Change and Forecasting Future Vulnerability in Alaskan Boreal Forest

Alaska Fire Science Workshop  
April 2, 2014



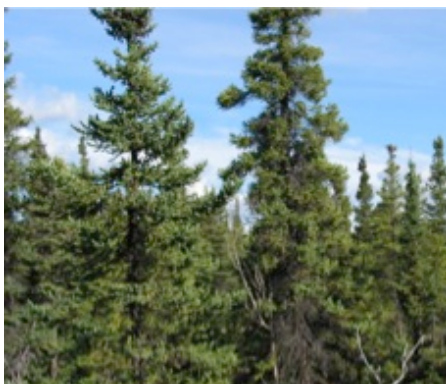
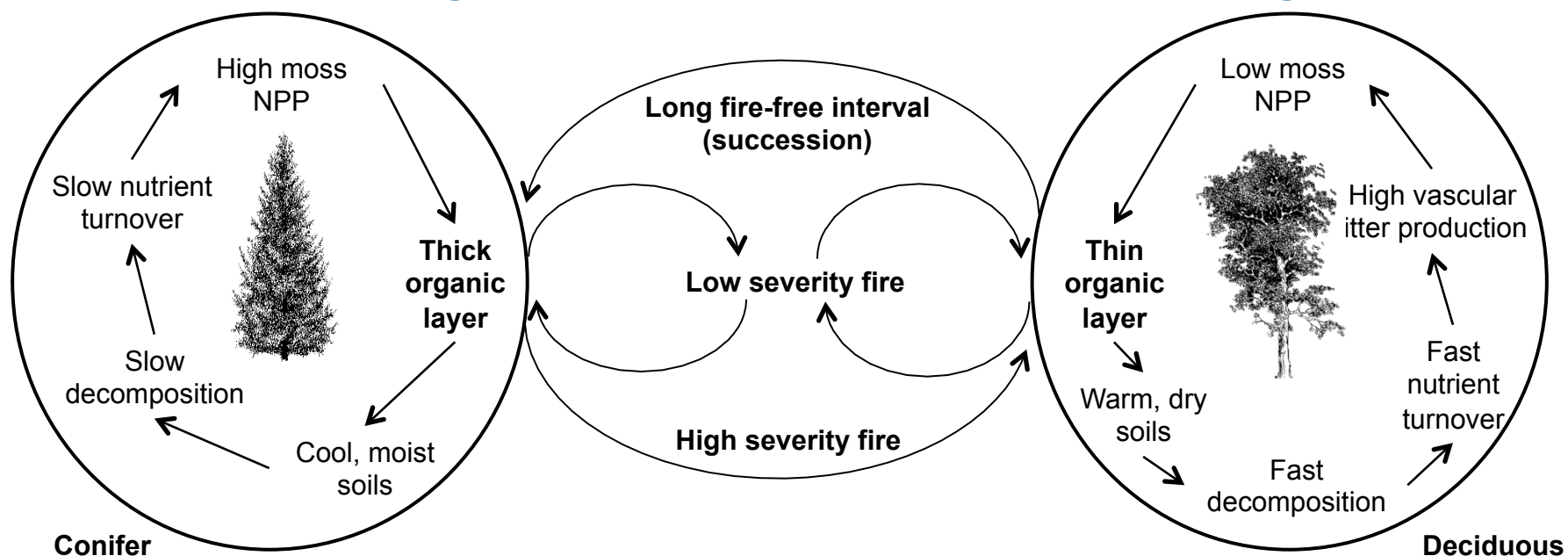
## Project Team

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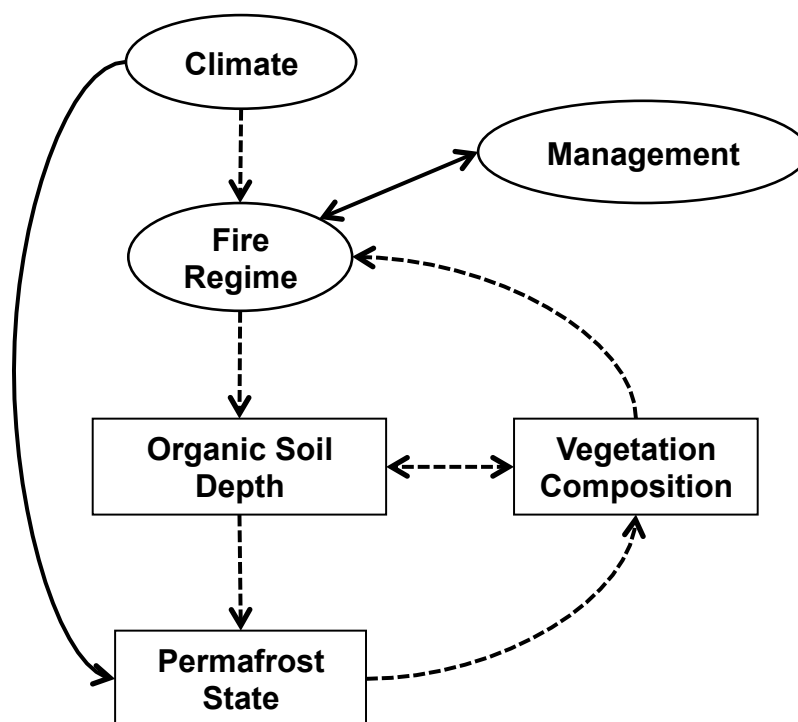
## Technical Objectives

- **Objective 1** is to determine mechanistic links among fire, soils, permafrost, and vegetation succession in order to develop and test field-based **ecosystem indicators** that can be used to directly predict ecosystem vulnerability to state change.
- **Objective 2** is to develop models that can **forecast landscape change** in response to projected changes in climate, fire regime, and fire management.

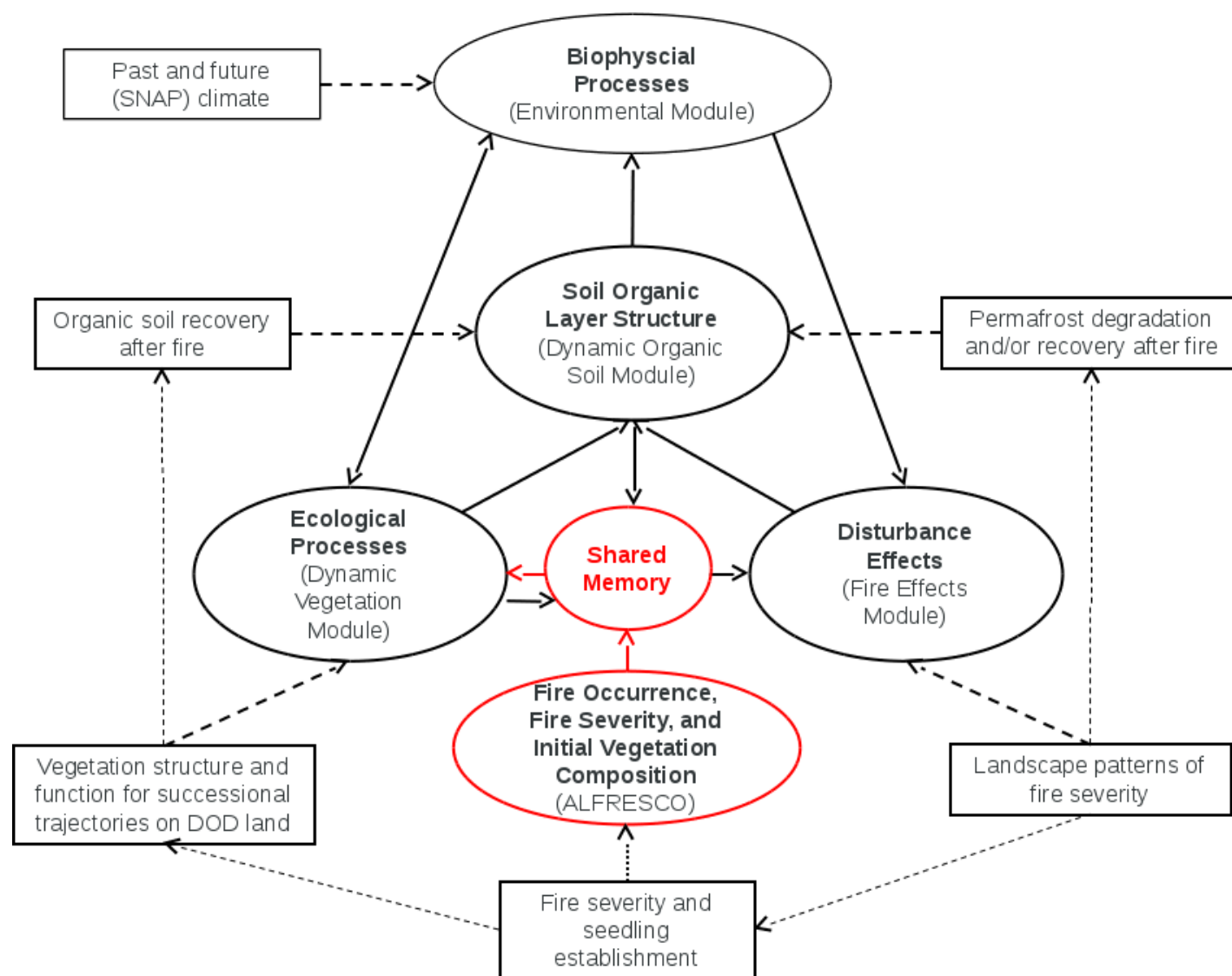
# Threshold Dynamics in Boreal Ecosystems



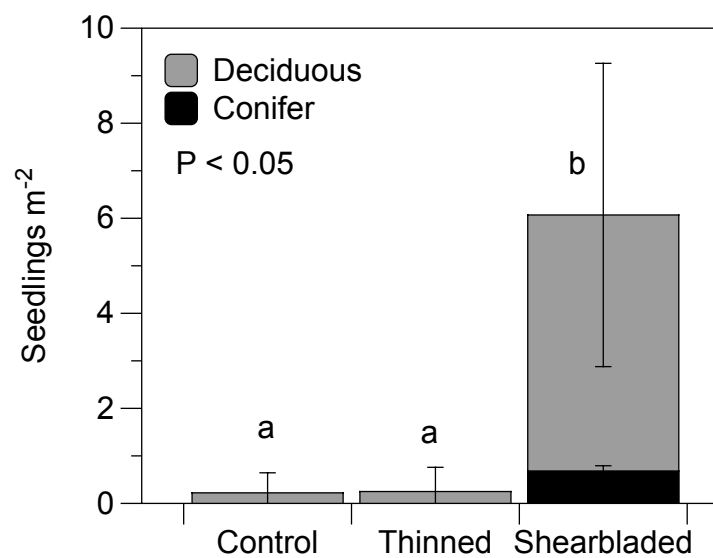
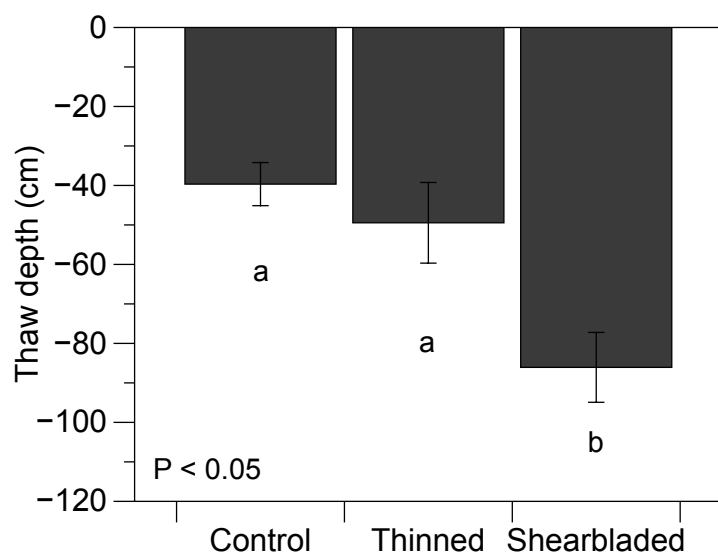
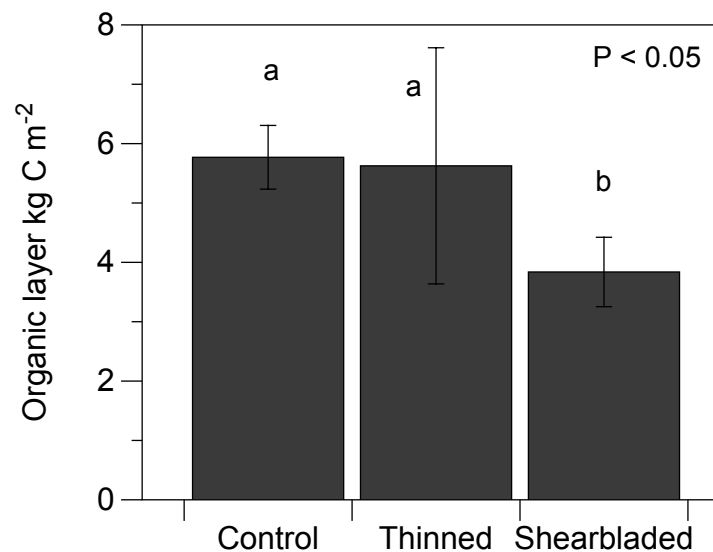
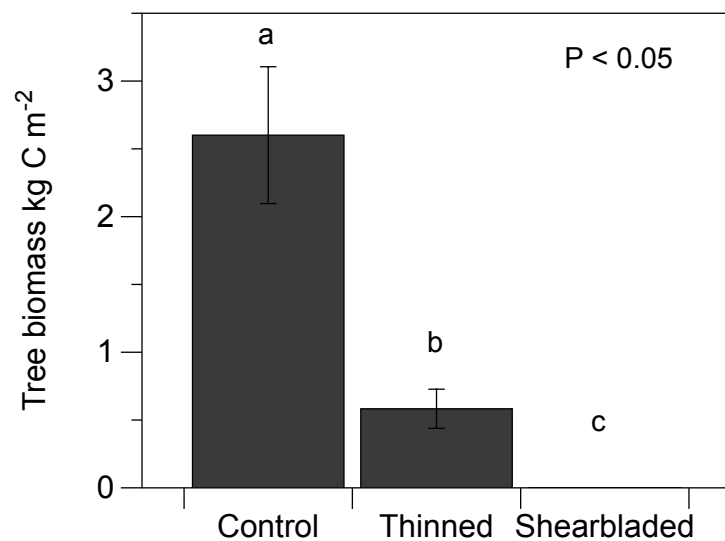
# State Change in the Permafrost Zone



# Modeling Framework

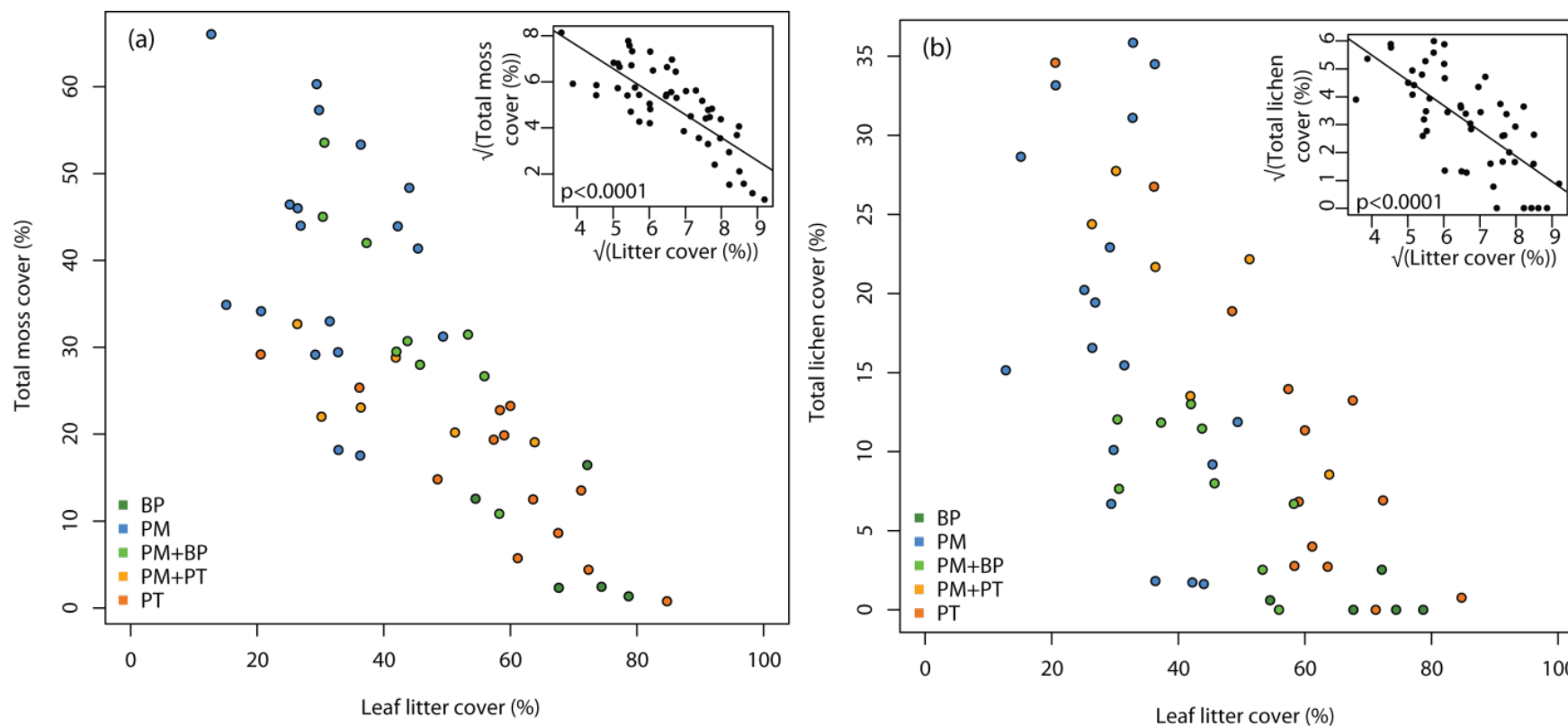


## Fuel treatments reduce C, destabilize permafrost, and alter fuel composition

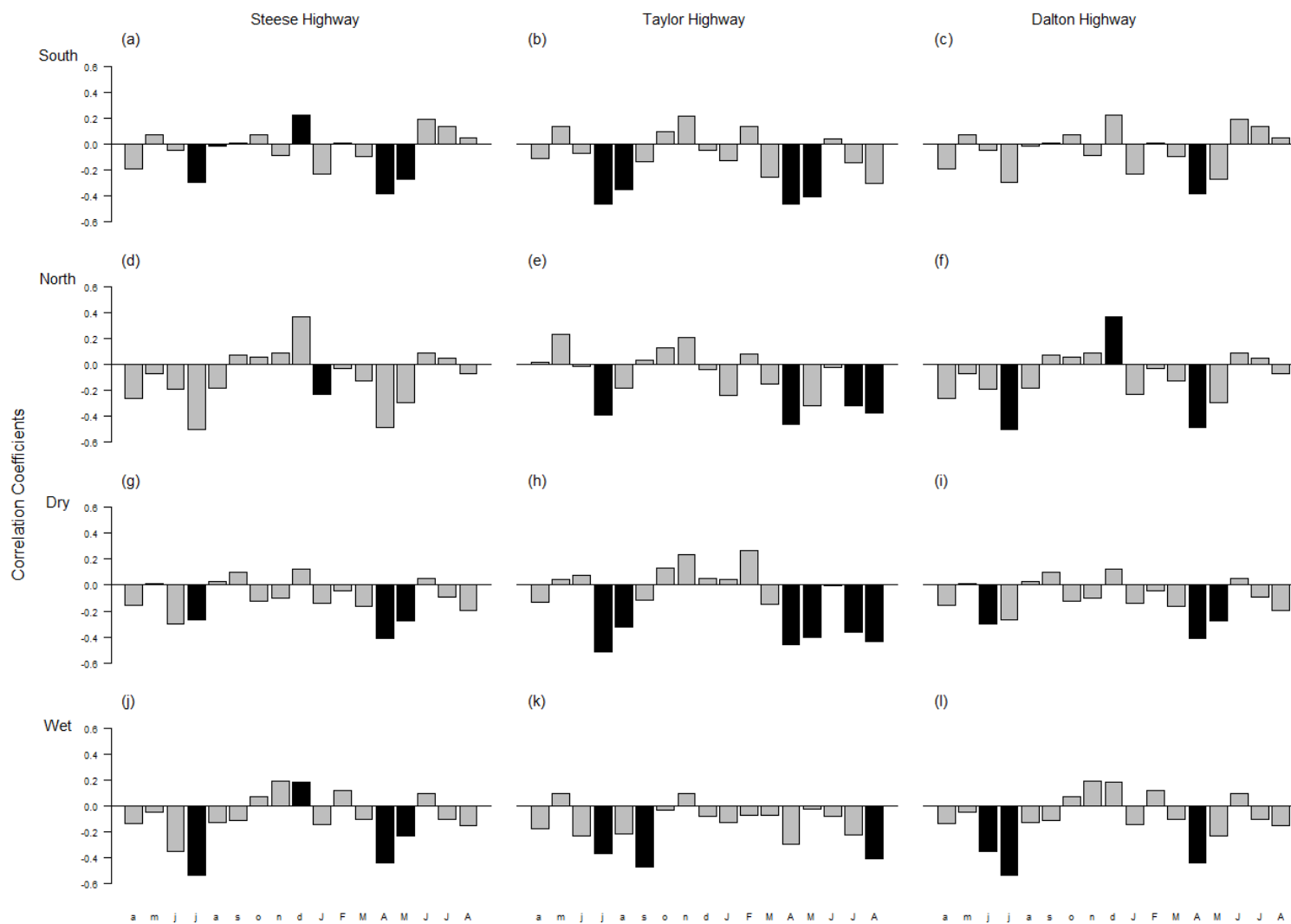


(A. Melvin)

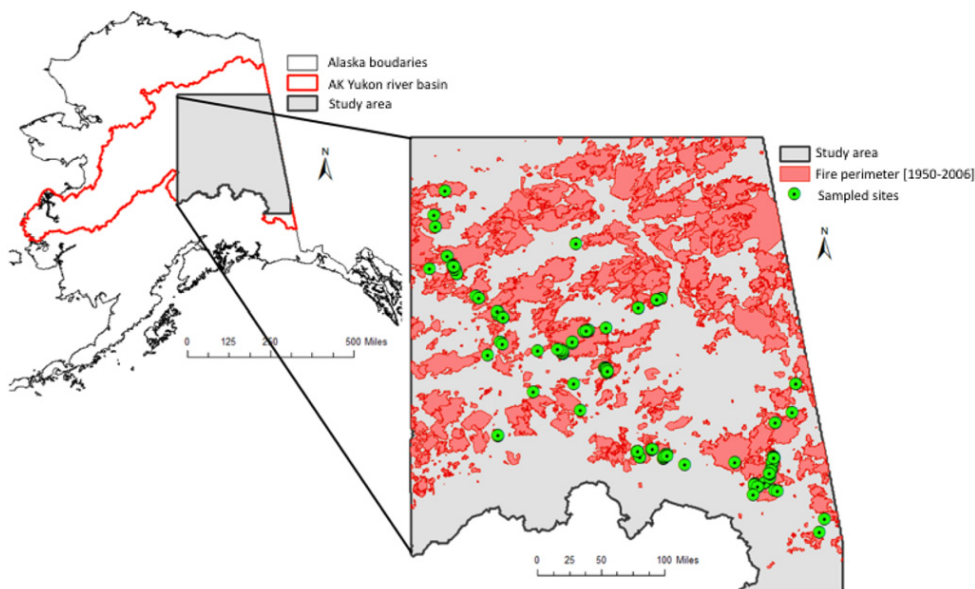
## Moss patterns differ among forest types and the amount of leaf litter



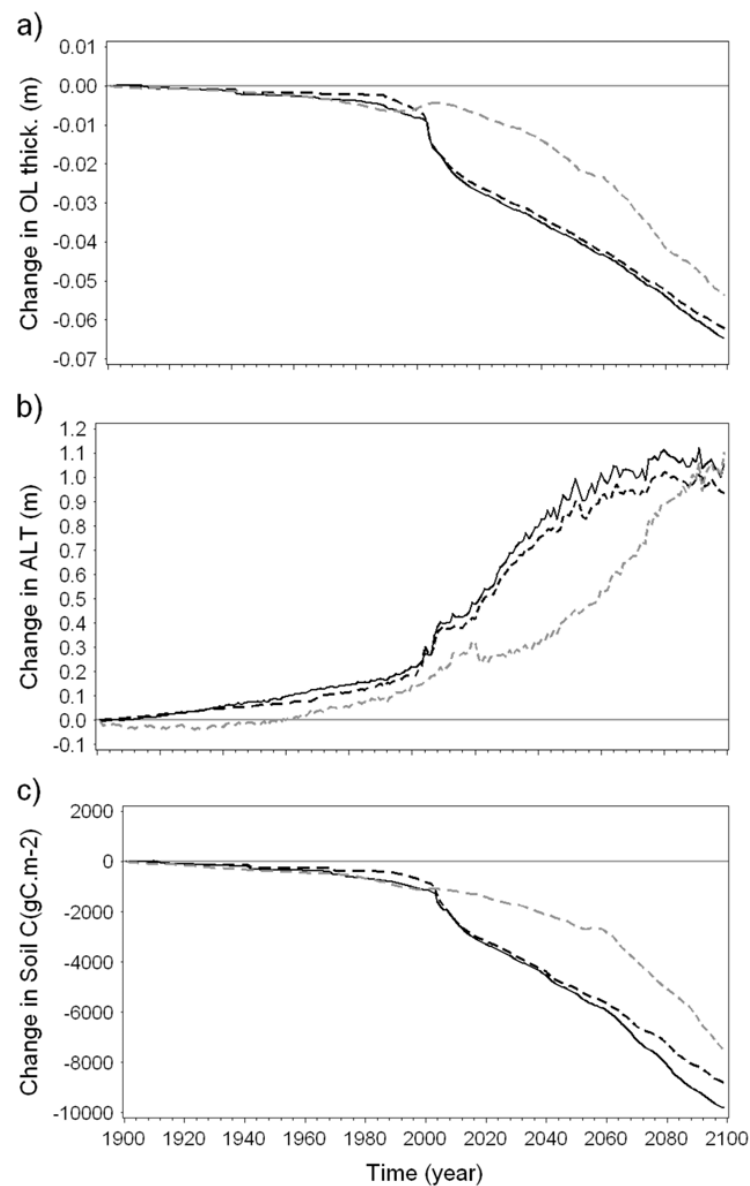
## Black spruce tree growth is negatively impacted by warming temperatures



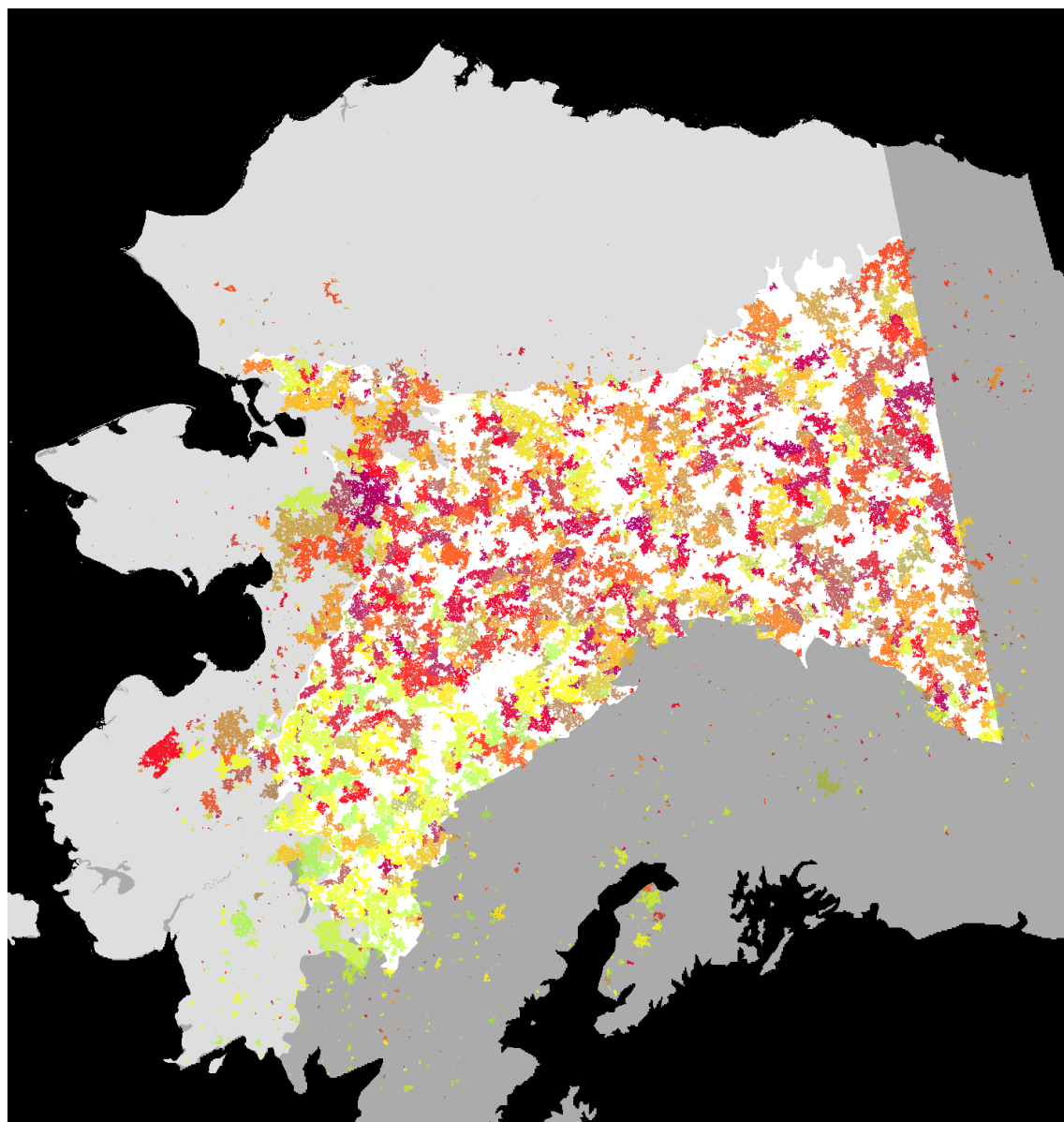
## Modeling organic layer loss, active layer, and soil carbon



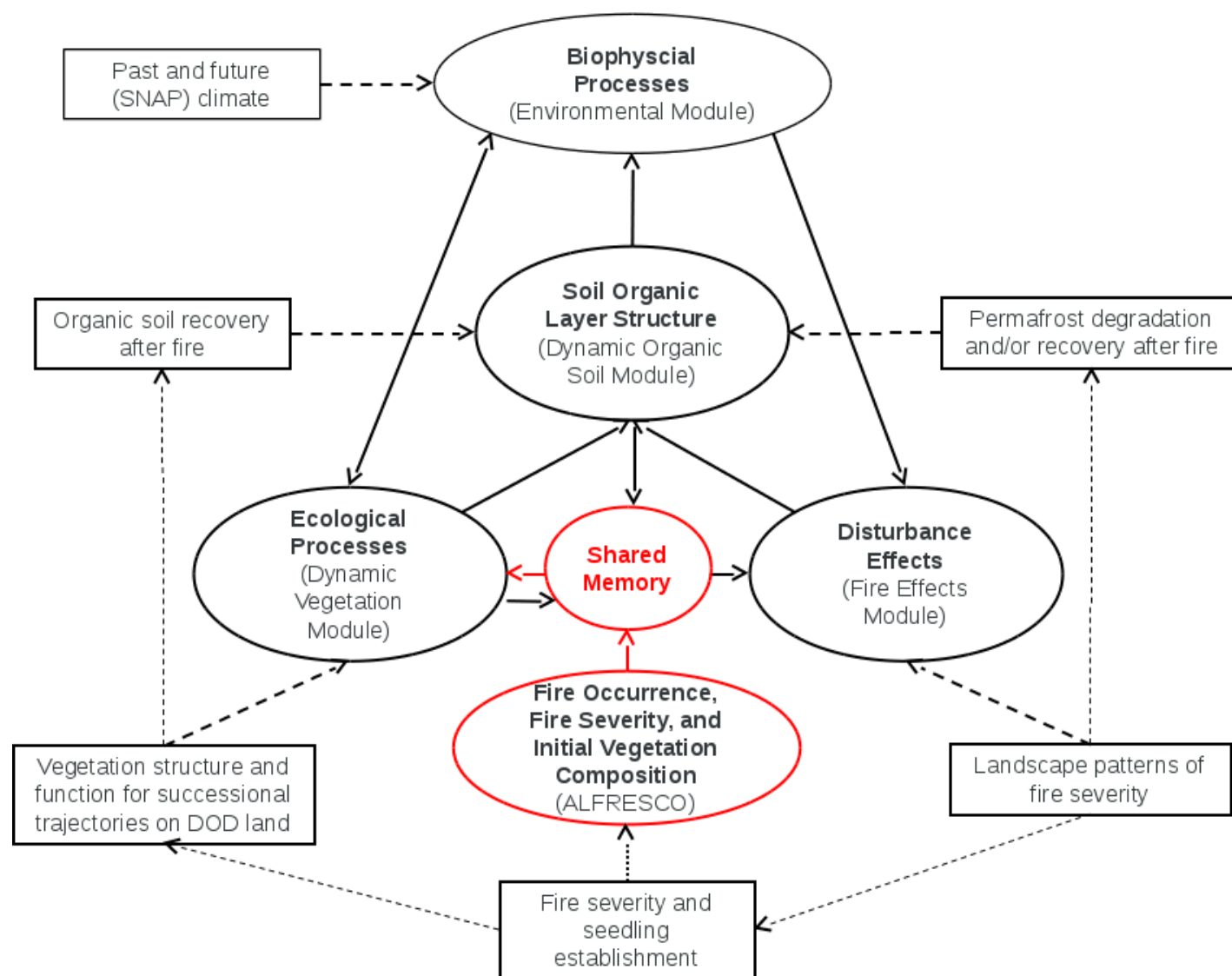
Parameters	Importance	Regression coefficient
Slope (deg)	1.071	0.098
N/S gradient	0.813	-0.074
Flow accumulation (log-transformed)	0.881	-0.080
Wetness index	1.325	-0.121
Relief index	1.058	0.096
ET/PET ( $n - 1$ )	0.858	0.078
VWC	0.816	-0.065
Date of burn	0.992	0.090
Area burned (km <sup>2</sup> )	1.143	0.104



## Simulating wildfire activity and severity



# Modeling Framework



## **Modeling activities to inform decision making on DoD training lands**

**Question 1: How does simulated fire frequency respond to different climate scenarios during the 21st Century on, and adjacent to, military lands of the Upper Tanana Valley?**

**Question 2: How might changes in the fire management options within military training land boundaries influence the frequency and extent of wildfire activity on, and adjacent to, military lands in the Upper Tanana Valley during the 21st Century?**

**Question 3: How might wildlife habitat suitability change on military lands in the Upper Tanana Valley through the 21st Century?**

